

REMARKS/ARGUMENTS

In accordance with 37 CFR 1.75(e), applicants Claim 1, which has been rejected as anticipated by Brown et al, U.S. Patent No. 4,161,856, contains in the following order:

(1) a preamble comprising a general description of all the elements or steps of the claimed combination which are conventional or known, (which are admittedly disclosed in the '856 reference),

(2) a phrase "wherein the improvement comprises", and

(3) those elements, steps, and/or relationships which constitute that portion of the claimed combination which the applicants consider as the new or improved portion.

The elements, steps, and/or relationships which constitute that portion of the claimed combination which applicants consider as the new and improved portion is a locking latch that pivots from a base in the connector at

"a bend in the form of an arc, whereby the locking latch pivots along the arc toward the base as the connector is stabbed through the slot."

In the drawings of the '856 reference, the locking lever, 37 (called a "tab" in '856) is pivoted at a bend in the form of a sharp angle from the base of the connector at 41a and 41b. In the specification of the '856 patent, in column 4, lines 58-61, numerals 41a and 41b indicate "edges." An edge describes a sharp bend, and not a bend in the form of an arc. The word

Appl. No. 10/754,323
Amdt. dated July 30, 2008
Reply to Office action of February 11, 2008

"edge" implies a sharp bend, as illustrated in the drawings of the '856. Such a sharp bend, as discussed in the disclosure of the present application, results in an immediate contact of the straight locking latch with the sides of the slot as the connector is stabbed through the slot. Applicants' bend in the form of arc, which delays contact, yields the numerous benefits set forth in the disclosure. Applicants' claimed invention with a bend in the form of an arc takes much less force, and less work to make a connection in a suspended ceiling grid than does a connector with a bend at a sharp, acute angle. The reasons for such a benefit are explained in detail in applicants' disclosure.

The remaining claims in the application are all dependent on claim 1, and include the limitation in the form of an arc, as well as additional limitations, so the above arguments apply to these additional claims.

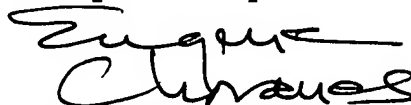
Applicants respectfully request reconsideration and early allowance of the claims.

The European Patent Office (EPO) has granted a patent in the corresponding European application. A copy of the allowance, along with a copy of the allowed claims, is attached.

30 July
2008

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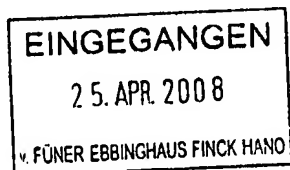
Respectfully submitted,



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Application No. 04 026 847.6 - 2303	Ref. EPAD-86347.8	Date 24.04.2008
Applicant Worthington Armstrong Venture		

Communication under Rule 71(3) EPC

You are informed that the Examining Division intends to grant a European patent on the basis of the above application with the text and drawings as indicated below:

In the text for the Contracting States:

AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LU MC NL PL PT RO SE SI SK TR

Description, Pages

2, 6, 7, 9	as originally filed
1, 4, 5, 8, 10-12	received on 30.11.2006 with letter of 30.11.2006
3	received on 10.04.2007 with letter of 10.04.2007

Claims, Numbers

1-4	received on 10.04.2007 with letter of 10.04.2007
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Drawings, Sheets

1, 3, 4	as originally filed
2	received on 10.04.2007 with letter of 10.04.2007

A copy of the relevant documents is enclosed

The title of the invention in the three official languages of the European Patent Office, the international patent classification, the designated Contracting States, the registered name of the applicant and the bibliographic data are shown on the attached EPO Form 2056.

You are requested within a non-extendable period of **four months** of notification of this communication

1.	to file 1 set of translations of the claim(s) in the two other EPO official languages;		EUR
2a.	to pay the fee for grant including the fee for printing up to and including 35 pages; Reference 007		790.00
2b.	to pay the printing fee for the 36th and each subsequent page; number of pages: 0	Reference 008	0.00
3.	to pay the additional claim fee(s) (R. 71(6) EPC); number of claims fees payable:	Reference 016	0.00
		Total amount	790.00

The mention of the grant of the patent shall be published in the European Patent Bulletin as soon as possible after the requirements concerning the translation of the claims and the payment of the fees for grant and printing, claims fees, designation fees and renewal fees as laid down in Rule 71(3), (4), (6) and (8) and (9) EPC are fulfilled.

Any divisional applications relating to this European patent application must be filed directly at the European Patent Office in Munich, The Hague or Berlin in accordance with Article 76(1) and Rule 36 EPC **before** the date on which the European Patent Bulletin mentions the grant of the patent (see Art. 97(3) EPC and OJ EPO 2/2002, 112).

If you do not approve the text intended for grant but wish to request amendments or corrections, the procedure described in Rule 71(4) EPC is to be followed.

If this communication is based upon an auxiliary request, and you reply within the time limit set that you maintain the main or a higher ranking request which is not allowable, the application will be refused (Art. 97(2) EPC).

If the enclosed claims contain amendments proposed by the Examining Division, and you reply within the time limit set that you cannot accept these amendments, refusal of the application under Article 97(2) EPC will result if agreement cannot be reached on the text for grant.

In all cases except those of the previous two paragraphs, if the fees for grant and printing or claims fees are not paid, or the translations are not filed, in due time, the European patent application will be deemed to be withdrawn (R. 71(7) EPC).

For all payments you are requested to use EPO Form 1010 or EPO Form 1010E or to refer to the relevant reference number.

After publication, the European patent specification can be downloaded free of charge from the EPO publication server <https://publications.european-patent-office.org> (OJ EPO 2005, 126).

Upon request in writing each proprietor will receive the certificate for the European patent **together with one copy** of the patent specification provided that the request is filed within the time limit of Rule 71(3) EPC. If such request has been previously filed, it has to be confirmed within the time limit of Rule 71(3) EPC. The requested copy is free of charge. If the request is filed after expiry of the Rule 71(3) EPC time limit, the certificate will be delivered without a copy of the patent specification.

Note on payment of renewal fees

If a renewal fee falls due between notification of the present communication and the proposed date of publication of the mention of the grant of the European patent, publication will be effected only after the renewal fee and any additional fee have been paid (R. 71(9) EPC).

Under Article 86(2) EPC, the obligation to pay renewal fees to the European Patent Office terminates with the payment of the renewal fee due in respect of the year in which the mention of the grant of the European patent is published.

Filing of translations in the Contracting States

Pursuant to Article 65(1) EPC the following Contracting States require a translation of the specification of the European patent in their/one of their official language(s) (R. 71(10) EPC), if this specification is not published in their/one of their official language(s)

- within **three months** of the publication of the mention of the grant:

AT	AUSTRIA	GR	GREECE
BE	BELGIUM	HU	HUNGARY
BG	BULGARIA	LI	LIECHTENSTEIN
CH	SWITZERLAND / LIECHTENSTEIN	IT	ITALY
CY	CYPRUS	NL	NETHERLANDS
CZ	CZECH REPUBLIC	PL	POLAND
DE	GERMANY	PT	PORTUGAL
DK	DENMARK	RO	ROMANIA
EE	ESTONIA	SE	SWEDEN
ES	SPAIN	SI	SLOVENIA *
		SK	SLOVAKIA
		TR	TURKEY
	UNITED KINGDOM		

* requires only a translation of the claims

- within **six months** of publication of the mention of the grant:

IE	IRELAND
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The date on which the mention of the grant of the European patent will be published in the European Patent Bulletin will be indicated in the decision to grant the European patent (EPO Form 2006A).

The translation must be filed with the national Patent Offices of the Contracting or Extension States in accordance with the provisions applying thereto in the State concerned. Further details (e.g. appointment of a national representative or indication of an address for service within the country) are given in the EPO information brochure "National law relating to the EPC" and in the supplementary information updates published in the Official Journal of the EPO, or are available on the EPO website.

Failure to supply such translation to the Contracting or Extension States in time and in accordance with the aforementioned requirements may result in the patent being deemed to be void ab initio in the State concerned.

Important note to users of the automatic debiting procedure

The fees for grant and printing and also any additional claims fees due under Rule 71(6) EPC will be debited automatically on the date of filing of the translation of the (relevant) claims, or on the last day of the period of this communication. However, if the designation fees become due as set out in Rule 71(8) EPC and/or a renewal fee becomes due as set out in Rule 71(9) EPC, these should be paid separately by another permitted means of payment in order not to delay the publication of the mention of grant. The same applies in these circumstances to the payment of extension fees. For further details see the Arrangements for the automatic debiting procedure (AAD) and accompanying Information from the EPO concerning the automatic debiting procedure (Annexes A.1 and A.2 to the Arrangements for deposit accounts (ADA) in Supplement to OJ EPO 10/2007).

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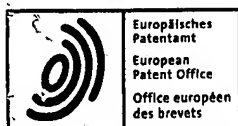
Enclosure(s): Form 2056
17 Copies of the relevant documents

+++ ATTENTION +++

New amounts of procedural fees as from 01.04.2008 (see OJ EPO 1/2008)!

If additional claims fees (R. 71(6) EPC)* are to be paid and payment is received on or after 01.04.2008, claims fees are only payable from the sixteenth claim onwards. New amount to be paid: EUR 200,- per additional claim.

* to be amended



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Annex to EPO Form 2004, Communication pursuant to Rule 71(3) EPC

Bibliographical data of European patent application No. 04 026 847.6

For the intended grant of the European patent, the bibliographical data are set out below, for information:

Title of invention: - Steckverbinder
- Stab-in connector
- Connecteur à fiche

Classification: INV. E04B9/12

Date of filing: 11.11.2004

Priority claimed: US /09.01.2004 /USA754323

Contracting States*
for which fees have
been paid: AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LU MC NL
PL PT RO SE SI SK TR

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- *) If the time limit for the payment of designation fees according to Rule 39(1) EPC has not yet expired and the applicant has not withdrawn any designation, **all Contracting States/Extension States** are currently still deemed to be designated. See also Rule 71(8) EPC. and, if applicable, the above Note to users of the automatic debiting procedure.
- **) If two or more applicants have designated different Contracting States, this is indicated here.

Worthington ~~Armstrong~~ Venture~~EPAD-86347.8~~~~locking connector~~
[STAB-IN CONNECTOR]**Druckexemplar**BACKGROUND OF THE INVENTION[Field of the invention]

Suspended ceilings are used extensively in commercial and industrial buildings. In such ceilings, a metal grid framework of interconnected main beams and cross beams is hung from a structural ceiling by wires. The grid supports acoustical panels in rectangular openings formed in the grid.

This invention relates to ^{locking} [the] connectors used in the grid to join a pair of opposing cross beams and a main beam at grid intersections.

[Prior Art]

Suspended ceilings having metal beams interconnected into a grid that supports panels are well known (U.S. Patents 5,839,246 ^{or U.S.} and 6,178,712, for instance).
[incorporated herein by reference, show such ceilings]

The grid in such ceilings has, at each grid intersection, a pair of opposing cross beams and a main beam that form a connection.

[The present invention relates to such a connection]

Each cross beam in such a connection has a connector at its end that is thrust, or stabbed-in, from opposing sides of the main beam, through a slot in the main beam. The connectors are all identical.

The connector that is first inserted into the slot is prevented from being withdrawn back out of the slot by the cantilevered latch in the connector, in the form of a pivoted flexible leaf spring. Such latch, which is integral with the connector base and formed therefrom by punching, is biased toward an open position. The latch, which is cantilevered at an angle from the base of the connector, flexes toward a closed position under the restraint of the side of the slot when the connector is stabbed through the slot to make the connection, but which then reflexes back to its biased rest position to prevent withdrawal of the connector back out of the slot.

Another connector on an opposing cross beam, identical to the first connector thrust through the slot, is then stabbed through the slot in the reduced space in the slot alongside the first. The latch on the connector contacts the side of the slot close to the latch pivot, and is flexed toward a closed position.

In inserting particularly the second connector into the slot, with a linear stab-in motion, substantial work and force are necessary to make the connection.

This resistance arises virtually immediately as the second connector into the slot enters the slot, and continues throughout the travel of the connector until it is seated in a locked position, as described below, with the first connector into the slot.

Both connectors interconnect when the second connector into the slot is fully inserted. Detents formed from the connector base, in the form of bulbs, that have a cam side and a locking side, and the ends of the connectors, flex and reflex to engage in what is sometimes referred to as a connector-to-connector lock, or "handshake" lock. Such a "handshake" connection between the connectors prevents the connectors from being pulled apart lineally out of the slot. The connectors are kept laterally and vertically together by the slot in the main beam.

In the seated locked position, the second connector is horizontally aligned with the first connector within the confines of the slot, so that the locking detents on the connectors are engaged and retained at the same level to form the connector-to-connector lock. Generally, the second connector must be either elevated or

depressed as it passes into the slot to achieve such horizontal alignment. Hence, the profile of the leading edge of the connector is tapered to guide the connector during its travel through the main beam slot.

of the generic kind in U.S. 5,839,246 or U.S. 4,317,641
Such connectors are ~~[well known in the prior art and are]~~ disclosed, for instance, *↓*
~~[in the above referred to patents]~~ *This prior art refers to a locking connector for a suspended ceiling grid as described in the preamble of claim 1.*
~~[Numerous such connections must be made to create a ceiling grid.]~~

SUMMARY OF THE PRESENT INVENTION

The object of the present invention is to provide a locking connector

~~[The prior art slab-in-connector described above is improved so]~~ that ~~[it]~~ takes much less force, and less work, to make the connection.

There is less work and less force necessary, because, in inserting the second connector into the reduced area of the slot of the main beam, (1) there is a delay in the contact between the locking latch and the side of the slot, so that during the delay, (2) elements in the ensuing connection are positioned while offering the least resistance from frictional forces to such positioning, and (3) when contact between elements does occur, the elements are positioned to offer the least resistance to making a connection.

To achieve the above, the locking latch, which in its unflexed position, must extend laterally far enough out from the base of the connector to prevent withdrawal of the first connector through the slot before the second connector is inserted, ~~[is pivoted from the connector base in an arc, rather than in an acute bend as in the prior art.]~~ *is formed with a curved portion before extending in straight lever fashion.*

This, as set forth in (1) above, delays contact between the latch and the side of the slot, when the second connector is inserted into the slot and, as set forth in (2) above, such contact is made further out along the latch from the pivot point, closer to the end of the latch, creating a longer lever arm, so that less force is needed to close the latch.

The outward end of the locking latch in an unflexed position, extends to the same position as the prior art straight latch pivoted at a sharp, acute angle. This position is necessary, so that the connector cannot be withdrawn after the latch passes through the slot.

Also, during the delay in (1) above, the second connector into the slot is being positioned vertically by the taper on the leading end of the connector, which engages either the top or bottom of the slot, to the same horizontal level as the first connector, without frictional resistance created in the connection of the prior art, where the locking latch, virtually immediately, forces the first and second connection laterally together.

By adjusting the second connector into the slot more quickly vertically as it travels through the slot ~~[the second connector, when]~~ ^{that together} the locking detents and connector ends engage ~~[in there]~~ ^{such engagement.} by flexing, are in a position, as set forth in (3) above, to offer the least resistance to ~~[flexing]~~.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a right side elevational of a connection of two cross beams through a slot in the main beam, showing the connectors of the invention engaged in a connector-to-connector lock.

Figure 2 is a right side elevational view of the connector of the invention, shown in the connection of Figure 1.

Figure 2a is a top sectional view of the connector of the invention, taken on the line A-A of Figure 2, with an enlarged circled portion showing the latch of the invention.

Figures 3 and 3a are views of a prior art corresponding to the views of Figures 2 and 2a.

Figure 3 is a side elevational view of a prior art connector.

Figure 3a is a top sectional view of a prior art connector taken on the line A-A of Figure 3, with an enlarged circled portion showing a prior art latch.

Figure 4 is a group of graphs, 4a, 4b, and 4c which represent the forces involved in making a connection.

Figure 4a is a graph of the force necessary to overcome resistance in making the connection of the prior art.

Figure 4b is a graph of the force necessary to overcome resistance in making the connection of the invention.

Figure 4c is a graph of the forces represented in 4a and 4b, overlapped.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The Prior Art

U.S. Patent 5,839,246, incorporated herein by reference, is representative of the prior art connection which is improved by this invention. The connection itself, and the method of making such connection, is set forth in detail in the '246 patent.

In the present drawings, a connection of the invention is shown in Figures 1, 1a, and [with the improvement of] the invention¹⁵ shown more clearly in Figure 2 and 2a. In the present connection, main beam 20, shown in cross section, extends longitudinally in a ceiling grid. Identical connectors 21 and 22 have been stabbed through a slot 23 in the web 25 of the main beam 20 and interconnect. The connectors 21 and 22 are connected respectively to cross beams 26 and 27 by rivets at 28.

In the connection, the following occurs:

- (1) End 30 of connector 21 engages detent 31 to form a connector-to-connector connection, as does end 32 of connector 22 engage detent 33;
- (2) Locking latches 40 on connector 21 and connector 22 are in an unflexed position;
- (3) Backstops 35 and 36 on connectors 21 and 22 secure the ends 30 and 32 in the connector-to-connector lock;

and

- (4) Connectors 21 and 22 are kept laterally and vertically constrained within slot 23 by the cross sectional configuration of the connectors, as well known in the art.

The general configuration so far described conforms to the prior art.

In making the connection shown in Figures 1 and 1a, and in the cited patents, a first connector, either connector 21 or 22, both being identical, is thrust or stabbed through the slot 23 in the prior art manner. In this explanation, it will assume connector 21 is first thrust through the slot.

Locking latch 40 contacts side of slot 23 and is flexed enough to allow the latch 40 to pass through slot 23 and reflex back to a rest position, in a one way movement. In this position, the first connector 21 through the slot is retained within the slot 23.

The second connector 22 is then thrust through the slot 23 along side the first connector 21 through the slot 23. Again, locking latch 40 contacts side of slot 23, but now there is less room in the slot because a connector has already been inserted. The second connector 22 into the slot, as it is thrust through the slot 23, flexes the latch 40 toward a closed position, until the latch passes through the slot after which it flexes open to a rest position. The connectors 21 and 22 also form a connector-to-

connector lock at this point, as seen in Figure 1, wherein the detents 31 and 33 and the beam ends 30 and 32 have flexed and then reflexed into a locked position, at rest.

In these stab-in connections, as the second connector into the slot, for instance connector 22, travels through the slot 23 to a seated position, after the first connector 21 into the slot has been inserted, the following occurs:

- (1) The second connector 22 is adjusted vertically within the slot 23.
- (2) The second connector 22 is forced laterally by a side of the slot 23 against the first connector 21.
- (3) The locking latch 40 on the second connector 22 is flexed toward a closed position by a side of the slot 23 until the latch 40 passes through the slot 23, and then it springs open to a rest position as seen for instance in Figure 1.
- (4) The locking detents 31 and 33 and connector ends 30 and 32 on the first and second connectors 21 and 22 are flexed apart as they contact one another, and then reflexed into a locking position.

In the prior art, (1) through (4) above overlapped or occurred virtually simultaneously, so that the force and work required to complete a connection 10 was not only the sum of the forces necessary to overcome the sum of the individual resistances created by (1), (2), (3) and (4) referred to immediately above, but also the force and work to overcome the friction created when forces (1), (2), (3) and (4) overlapped, or occurred simultaneously. These frictional resistances included:

- a. The friction between the latch 40 on the second connector 22 and the side of the slot 23 as the second connector 22 was being positioned vertically in the slot 23.
- b. The friction laterally between the base of the connectors 21 and 22.

- c. The friction between the top or bottom of the second connector 22 and the top or bottom of the slot 23 as the second connector 22 was being positioned vertically within the slot 23.
- d. The friction between the detents 31 and 33 and ends 30 and 32 on the first connector 21 into the slot and second connector 22 into the slot 23 as the second connector 22 was being vertically positioned within the slot 23.

In the prior art, in an attempt to reduce the total force and work required, the taper 37 or slope on the leading edge of a prior art connector 15, as seen in Figure 3, was made at a gradual incline, so the frictional forces could be spread throughout the length of the insertion, as the second connector into the slot 23 was being adjusted vertically.

[The Present Improvement]

The present ^{invention} ~~[improvement]~~ reduces substantially the force necessary to overcome the resistance from the frictions (a), (b), (c) and (d) above and the forces necessary in (3) above to flex the locking latch 40 of the invention toward a closed position, and in (4) above to flex the detents 31 and 33 and ends 30 and 32 relative to one another to create the connector-to-connector interlock.

As in the prior art, in the present ^{invention} ~~[improvement]~~ the cantilevered leaf spring latch 40 continues to be formed, as by punching, from the connector base 39, as seen, for instance, in Figures 2 and 2a. The latch of the prior art, designated 10 as seen in Figures 3 and 3a, is in the form of a straight lever 11, pivoted at 12. It forms an acute sharp angle with the base 13 of prior art connector 15.

In the ^{present} ~~[improvement on the]~~ invention, the latch of the invention 40, as seen in Figures 2 and 2a, herein, is formed from the base 41 with a radius 42, for instance ^{0.7 cm} (0.04 inches), before extending in straight lever fashion. The straight portion 43 of the latch of the invention 40 forms an angle of about 429 with the base 41. Such a curve

in locking latch 40 increases the distance 46 the second connector 21 or 22, enters into the slot 23 before it contacts the side of the slot 23 at 47 to create a resistance from such latch of the invention 40 against the side of the slot 23. Such a curved locking latch of the invention 40 also reduces the distance 48 the latch of the invention 40 is in contact with the side of the slot 23 as it is being flexed toward a closed position as it passes through the slot 23, since it contacts the latch 40 closer to the end of the latch than does prior art straight latch 10.

Representative dimensions for the locking latch 40 of the invention are shown in Figure 2a.

Further, the first contact of the latch of the invention 40 with the side of the slot 23 is further out from the point 51 of the latch of the invention 40 where it is joined to on the base 41, since part of the curved part of the latch of the invention 40 extends in the plane of the base 41 and is not exposed to contact by the side of the slot 23. Point 51 is the cutting start and the bending start of the latch of the invention 40 as seen in Figure 2a.

Thus, the force exerted by the side of the slot 23 as the latch of the invention 40 passes through the slot is applied further from the pivot point 51 than in the prior art, thus requiring less force to pivot the latch of the invention 40, than in the prior art straight lever latch 10, since the force has a greater lever arm in the latch of the invention 40 when it meets the side of slot 23 as it is thrust into the connection.

Thus, less force over a shorter distance is required to collapse the latch of the invention 40 than was required to collapse latch 10 in the prior art. This results in substantially less work that has to be done to make a connection. This beneficial effect in one connection, is multiplied by the many connections required in forming a ceiling grid for a suspended ceiling.

In the connection improved by the present invention, during the time the connector is being inserted, it is necessary to adjust the connector vertically, so that when fully inserted, the connector fits vertically into the slot 23.

Since the force necessary to collapse the latch 10 of the prior art was substantial, and arose near the leading edge of the connector, the taper that guided the connector vertically to its fully seated position so that the connector was in place vertically when fully inserted, was gradual, to limit the added resistance at any one point in the insertion.

Thus, even when the connector-to-connector interlock was being created, wherein the detents were flexing, the connector was still being adjusted vertically, in view of such necessity to make the taper gradual rather than abrupt, thereby creating still more resistance.

In the present invention, the taper 38 at the leading edge of the connector 21, 22 is made relatively abrupt, at a steeper angle, so that a relative immediate adjustment is made vertically to the connector as it is being inserted into the slot 23. Even though a more steep, immediate adjustment would normally require a greater insertion force than that of a gradual insertion, there is less, rather than more force required. This reduction in force is obtained by the delayed contact of the locking latch of the invention 40 with the side of slot 23, since there is virtually no drag or resistance from the locking latch of the invention 40.

There is a further benefit that is achieved by early vertical positioning of the connector within the slot 23 during insertion. As the detents 31 and 33, and the ends 30 and 32 of the first and second connectors of the invention 20 and 21 come into contact, the detents and ends are at a position relative to one another, vertically, where there is least resistance to flexing of these elements laterally into the locking position. Whereas in the prior art, contact was made between detents and ends, and force was exerted between these elements, off-center from their most flexible position, the force required to flex the detents and ends, was again substantial.

Figures 3 and 3a show a prior art connector, while Figures 2 and 2a show a ^{locking} connector ^{present} [with the improvement] of the invention.

As seen in Figures 3 and 3a, prior art latch 10 in the form of straight lever 11, is pivoted at an acute angle to base 13 of a prior art connector 15. Dotted line 17

represents, in the enlarged portion, the side of slot 23 as the connector 15 of the prior art is inserted into the slot 23. The prior art connector 15 travels the distance at 16 before it encounters the side of the slot at 19, which is at a distance 18 from the end of the prior art latch 10.

In Figures 2 and 2a, there is shown the connector of the invention 22, which is identical to the connector of the invention 21, with the latch of the invention 40. Again, as in Figure 3a, dotted line 17 in the enlarged portion, represents the side of slot 23 as the connector 22 is inserted into the slot 23. The connector 22 travels the distance 46 before it encounters the side of the slot 23 at 47. This is a distance 48 from the end of the latch of the invention 40.

The benefits of the present *invention* [improvement] over the prior art are shown graphically in Figures 4a, 4b and 4c.

Figure 4, including 4a, 4b, and 4c, shows the resistances encountered in a prior art connection compared to the forces encountered in a connection with the improved connector of the invention.

In the prior art, the line from 80 to 81 represents the resistance encountered during the initial insertion of the second connector into the slot, while the latch 10 is being flexed from its initial contact with the side of the slot 23, until the resistance reaches its highest at about 27 pounds at point 81.

The contact of the straight lever 11 of prior art latch 10 is relatively close to the pivot 12 during this travel. At 81, there is a drop off in resistance during travel to point 82 to about 10 pounds. The straight lever latch 10 of the prior art during this drop off, contacts the side of the slot 23 further out along its straight lever 11, as it travels through the slot 23, so less force is necessary, since the lever arm is longer than at the initial contact.

At 82 there is a rise again in resistance due to the flexing of the detents 31 and 33 and connector ends 30 and 32 while they are forming a connector-to-connector lock. The resistance rises to point 83 at which point the connector-to-connector lock

is completed, and all elements have reflexed to a rest position with no further resistance or movement occurring.

The forces required to overcome the resistance encountered in making a connection with the improvement of the invention is shown graphically in Figure 4a. The same movement of the second connector 22 into the slot 23, having the latch of the invention 40, is shown, as was shown with the prior art connector, in Figure 4a. Initial contact with the side of the slot 23 occurs at 90 and rises to 91 where there is a resistance of about 14 pounds. There is a very slight drop off in resistance as the latch of the invention 40 passes through the slot. The resistance then rises to point 93 at about 16 pounds while the connector-to-connector lock is being formed as the detents 31 and 33 and connector ends 30 and 32 are flexing, after which there is a drop off at point 94, where all resistance ends after the connector-to-connector lock is formed.

The force necessary, and the distance over which the force must be applied, is obviously remarkably less, in making the connection, with ~~[the present improvement]~~ ^{locking} in the connector, *of the present invention.*

Figure 4c overlaps the charts of Figures 4a and 4b with the locked position of the prior art connection, and the connection of the invention as an overlapped common point along the horizontal axis at 96. ΔX in the chart represent the distance of the delay in contact between the prior art latch 15, and the latch of the invention 40, with the side 17 of the slot 23, as the second connector into the slot is being inserted. Again, Figure 4c, in chart form, represents the substantial reduction in force, and work necessary to make the present connection, over that to make the prior art connection.

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CLAIMS

1. A locking connector (21, 22) for a suspended ceiling grid comprising a main beam (20) and cross beams (26, 27),
 - wherein the locking connector (21) is designed to be stabbed through a slot (23) in the main beam (20) to lock with an opposing identical locking connector (22) already in the slot (23) and has a cantilevered locking latch (40) being integral with and pivoted from a base (41) in the locking connector (21), and
 - wherein, when the locking connector (21, 22) is stabbed through the slot (23) in the main beam (20), the locking latch (40) can be forced by a side of the slot (23) to flex toward the base (41) to permit the locking latch (40) to pass through the slot (23), and when the locking connector (21, 22) has been stabbed through the slot (23), the locking latch (40) can flex back to its relaxed position wherein it is pivoted away from the base (41),characterized in that the locking latch (40) is formed with a curved portion before extending in straight lever fashion.
2. The locking connector according to claim 1, characterized in that the curved portion forms a radius of about 0.1 cm (0.04 inches).
3. The locking connector according to claim 1, characterized in that the locking latch (40) has a straight portion (43) which forms an angle of about 42° with the base (41).
4. The locking connector according to claim 1, characterized in that a delay in contact between the side of the slot (23) and the locking latch (40) is provided when the locking connector (21, 22) is stabbed through the slot (23).